

**REMARKS**

The non-final Office Action issued August 27, 2002 has been reviewed and the comments of the U.S. Patent and Trademark Office have been considered. Claims 12 and 13 have been canceled without prejudice or disclaimer. Claims 1, 5-11, 14, 15, 20-25, 29, 31-38, 40, and 42-50 have been amended. Claim 62 has been added. Claims 55-61 are withdrawn from consideration. Accordingly, Applicants request reconsideration of the pending claims 1-11, 14, 15, and 20-62.

Claims 1-15 and 20-54 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 4,296,816 to Fischer in view of U.S. Patent 5,810,263 to Tramm. Applicants respectfully traverse the rejection because the claimed invention as a whole is not taught or suggested by the relied-upon references.

Applicants submit that the relied-upon prior art fails to teach or suggest a sidewall sprinkler with a K-factor greater than 9 that provides for effective water distribution to control an ordinary hazard fire in an extended coverage area. The claimed invention as a whole (as recited in independent claims 1, 20, 24, 25, 42, 45, 46, 47, and 50) recites a sidewall sprinkler with a K-factor greater than 9 that has one or more of the following features: (1) a canopy with a free end facing away from an outlet of the sprinkler; (2) a face portion of a deflector that consists of a single flow opening; and (3) a surface of a canopy portion distal to an outlet of the sprinkler that consists of a generally flat surface perpendicular to a plane passing through an axis of the sprinkler. Support for the amendments to the claims is provided by the originally filed specification at, for example, pages 4-13 and illustrated in originally filed Figs 1-13.

Each of claims 1, 20, 42, and 45 recites a sidewall sprinkler with a K-factor greater than 9 with, *inter alia*, a canopy portion that is coupled to the face portion at a first canopy end and extends generally along the axis away from the outlet towards a free end. The first canopy end is spaced at a first distance from the outlet, and the free end is spaced from the outlet at a second distance greater than the first distance.

Fischer fails to teach or suggest a sidewall sprinkler with a K-factor of greater than 9. Tramm is specifically relied upon by the Office Action for the teaching of a range of K-factors, e.g., 10.5 to 13. Applicants submit that to utilize the range of K-factors in Tramm, one skilled in the art would utilize other structural features of Tramm in modifying Fischer in an attempt to provide for a sidewall sprinkler that would work for its intended purpose through a range of K-factors greater than 9 as specified Tramm. In particular, Tramm states, at column 7, lines 60-67 and column 8, lines 1-12, that a deflector 22 has a flow confining portion 48 with a leading edge 60 spaced away from the orifice 16. The deflector 22 of Tramm also has segments 50, 51 spaced closer to the orifice 16 than the leading edge 60. Tramm states that the rearward facing segments 50, 51 allow the sprinkler to achieve its desired spray pattern. Thus, Tramm teaches away from a combination of Fischer because Tramm requires that the flow confining portion 48 faces rearward in order to provide for a sprinkler with a range of K-factors greater than 9.

If one of ordinary skill in the art were to rely upon Tramm in an attempt to cure the deficiencies of Fischer, one of ordinary skill would be taught to orient the canopy of Fischer towards a sprinkler's outlet at an angle with respect to a horizontal plane. The proposed combination of Tramm with Fischer, however, could render Fischer unsuitable for its intended purpose because Fischer specifically orients the canopy away from the outlet of the sprinkler so that a channel 90 is able to deliver a desired water density towards a center of a room (Fischer, col. 4, lines 47-55). Thus, if the canopy of Fischer is oriented towards the sprinkler outlet as required by Tramm, Fischer may not deliver the desired water density to a desired location in the room, which could render Fischer unsuitable for its intended purpose. Accordingly, claims 1, 20, 42, and 45 are patentable because Fischer or Tramm, singularly or in combination thereof, fails to teach or suggest the features of the claimed invention as a whole.

Each of claims 24, 47, and 48 recites a sidewall sprinkler with a K-factor greater than 9 with, *inter alia*, a face portion that consists of a single flow opening, and a canopy portion that is coupled to the face portion by only two support arms to define the single flow opening therebetween.

Fischer and Tramm provide for a face portion that has more than one flow opening. Neither Fischer nor Tramm teaches or suggests modifying their multiple flow openings into a single flow opening, as recited in claims 24, 47, and 48. In particular, Fischer states, at column 3, lines 66-68 to column 4, lines 1-7, that a deflector plate 38 has two rectangular slots 77 and an aperture 79 to distribute water flow. The two rectangular slots 77 of Fischer distribute water onto the intermediate floor area adjacent the sprinkler of Fischer while the aperture 79 controls distribution of water to a wall afar from the sprinkler. That is, Fischer requires three flow openings in order to provide for sufficient coverage of a protection area. Tramm, on the other hand, requires four flow openings so that three vertical support members are formed for a specific strength requirement. In particular, Tramm provides for four openings 54, 55, 56, and 57 symmetrical about the centerline of Tramm in order to form three vertical support members 42, 44, 45 so that the sprinkler could comply with testing requirements of the Loss Prevention Certification Board in the United Kingdom (Tramm at col. 7, lines 50-53 and col. 8, lines 24-31) while providing sufficient coverage of a protection area. Thus, neither Fischer nor Tramm teaches or suggests modifying the face portion of Fischer or Tramm to provide for a face portion consisting of a single flow opening, and such modification could render either of the sprinklers unsuitable for their intended purpose. Accordingly, claims 24, 47, and 48 are patentable because Fischer or Tramm, singularly or in combination thereof, fails to teach or suggest the claimed invention as a whole.

Each of claims 25, 46, and 50 recites a sidewall sprinkler with a K-factor greater than 9 with, *inter alia*, a deflector that has a canopy portion generally parallel to an axis of the sprinkler, which canopy portion has a surface distal to the outlet. The distal surface consists of a flat surface generally perpendicular to a plane passing through an axis of a passageway of the sprinkler.

Fischer fails to teach or suggest a sprinkler having a K-factor greater than 9 with a canopy portion that has a flat surface distal to an outlet, which distal surface is perpendicular to a plane passing through an axis of the sprinkler. Instead, Fischer requires a channel 90 that is compound curved (i.e., arcuate and parabolic) in order for a confining element 62 to provide for a desired

water density of the sprinkler. *See*, Fischer at col. 3, lines 22-38 and Figs. 2 and 3. The channel 90 is distal (i.e., situated farthest away) from throat 31. However, the channel 90 is formed by an arcuate and parabolic undersurface that is inclined from a horizontal axis instead being a generally flat surface perpendicular to a plane passing through the horizontal axis (which axis is defined in Fischer at col. 2, lines 58-59).

One of ordinary skill in the art would not be motivated to provide for a flat surface for the channel 90 because Fischer relies on the "Coanda effect" generated by the compound curved channel 90 in order to induce the flow via this effect to remain attached to the undersurface of channel 90 so as to lift the flow of fire-retardant fluid upward. *See*, Fischer at col. 4, lines 24-32. Fischer specifically states that testing confirmed that, without this curved channel 90, the sprinkler of Fischer failed to provide for the desired improvement in coverage. *See*, Fischer at col. 4, lines 33-37. Thus, absent Applicants' disclosure, there is no motivation to modify the compound-curved channel 90 of Fischer into a generally flat surface and to provide for the claimed sidewall sprinkler.

Notwithstanding the express teaching in Fischer for the requirement of the compound curved channel 90, Tramm is relied upon in combination with Fischer to allegedly render claims 24, 46, and 50 obvious. Tramm fails to teach or suggest a distal surface of a canopy portion that is parallel to a horizontal axis A and consists of a flat surface perpendicular to a plane passing through the axis A. Tramm relies on the leading edge 60 to define an upper portion of the water spray pattern that, in conjunction with a major segment 49, provides a sufficient rearward spray pattern. *See*, Tramm at col. 8, lines 5-12. Thus, Tramm fails to cure the deficiencies in Fischer. Accordingly, claims 25, 46, and 50 are patentable.

Claims 25-49 stand rejected under 35 U.S.C. 112, first paragraph, as allegedly failing to provide support for terms recited in the claims and therefore fails to reasonably convey to one skilled in the art that Applicants had possession of the claimed invention.

Applicants respectfully assert that, at the time of filing of this application, the inventors had possession of the claimed invention. As stated in MPEP § 2163 (8th Ed. August 2001), "[a]n applicant shows possession of the claimed invention by describing the claimed invention

*... using such descriptive means as words, structures, figures, diagrams and formulas that fully set forth the claimed invention.*” Applicants submit that the originally filed application demonstrates that Applicants had possession of the claimed invention in view of originally filed Figs. 1-13 and the originally filed textual description for these figures.

In particular, Applicants have shown possession of the claimed invention as a whole as recited in claims 25-49 by at least the following features described in the originally filed specification and shown in the originally filed figures, as indicated: (1) a trigger 38 that is illustrated as being “unactuated” (Fig. 1); (2) a canopy 44 that is disposed in one or more orientations (Figs. 3 and 8) as being parallel or oblique to an axis of the sprinkler; (3) one or more frame arms (Fig. 1); and (4) one or more pipes (unlabeled) and one or more sprinklers (Figs. 12 and 13). Thus, one skilled in the art would appreciate that the originally filed Figures 1-13 illustrate the features of the claimed invention as a whole so as to clearly support that the originally filed application, including the drawings, unequivocally conveys that the inventors had possession of the claimed invention. Accordingly, the rejection for allegedly failing to provide a written description of the claimed invention should be withdrawn.

Claims 1-15 and 20-54 stand objected to and the specification stands rejected under 35 U.S.C. § 112, first paragraph, for reciting minimum values using the recitations “at least ...,” “... or greater,” “greater than ...,” and “... or more” that are, in the Examiner’s belief, enabling for the minimum values recited but are not enabling for a hypothetical upper limit of infinity. Applicants assert that the Examiner’s contention is not well founded based on the originally filed specification and drawings.

Applicants, however, have amended certain claims without prejudice or disclaimer to revise the language deemed unacceptable to the Examiner, solely for the purpose of advancing prosecution. For example, Applicants have provided for an upper limit for the features of K-factor, area of extended coverage, water density, flow rates, or structural dimensions of the claimed extended coverage sidewall sprinkler recited in claims 7, 14, 15, 21, 24, 25, 29, 32-38, 40, 43-50—even though one skilled in the art would understand that each of the claimed features is for an extended coverage sidewall sprinkler according to the claimed invention as a whole, and

specifying an upper limit for each of the claimed features is not required so long as the sprinkler functions for its intended purpose as an extended coverage sidewall sprinkler. Thus, Applicants request withdrawal of the objection and the rejection to the claims.

Notwithstanding Applicants' effort to advance prosecution, Applicants assert that claims 1, 20, and 42 that recite one or more of the claimed minimum values are enabled because one skilled in the art would be able to make and use the claimed invention for values higher than the respective minimum values as long as the claimed invention as a whole functions for its intended purpose as an extended coverage sidewall sprinkler. Applicants believe that they are entitled to define an extended coverage sidewall sprinkler in a manner that particularly points out and distinctly claims their invention because they are the first to invent such a sidewall sprinkler with a K-factor greater than 9 that can provide for a water density of at least 0.15 gallons per minute per square feet, a flow rate of at least 38 gallons per minute, or an extended coverage area of at least 256 square feet.

Moreover, Applicants assert that one skilled in the art would not, as a matter of technical reasoning, reasonably construe that these minimum values render the scope of the claims to cover infinite values because one skilled in the art would not glean from the originally filed specification that Applicants intended to cover infinite values with the claimed invention as a whole. When the claims recite a minimum value, one skilled in the art would understand that the claimed invention allows for values greater than the minimum values recited in the claims so long as the claimed invention functions for its intended purpose. Thus, for example, the minimum K-factor recited by the claims provides for a sprinkler that performs for its intended function as a sidewall sprinkler, and such person skilled in the art would be able to determine an appropriate upper limit of the K-factor for the sprinkler such that the sprinkler functions for its purpose as a sidewall sprinkler in order to protect an extended coverage area.

In the same manner, when the claims recite a sprinkler with a minimum of one frame arm, one skilled in the art would appreciate that the sprinkler can have more than one frame arm and can have up to a reasonable number of frame arms that will allow the sprinkler to function for its intended purpose. One skilled in the art would also appreciate that that it would not be

possible to theoretically have, for example, an infinite number of frame arms on a single sprinkler because an infinite number of frame arms could prevent water flowing from an outlet of the sprinkler and would prevent such apparatus from functioning for its intended purpose as a sprinkler.

Furthermore, where the claims recite a system that has at least one sprinkler being coupled to at least one pipe, such as, for example in claim 50, one skilled in the art would be able to determine the appropriate number of sprinklers and pipes depending on the coverage area to be protected. *See*, e.g., the originally filed specification, at page 11, that references NFPA 13. Nothing in the specification and claims would suggest to one skilled in the art to place an infinite number of sprinklers and pipes for coverage of a protected area. Thus, one skilled in the art would understand the scope of the claims to cover a system that provides for an appropriate number of pipes and sprinklers in a system suitable for its intended purpose as claimed.

Thus, Applicants respectfully request withdrawal of the objection and the rejection to the claims because the Examiner's conclusion that the scope of the claims is not commensurate with the originally filed specification is inappropriate in an art for which a preferred embodiment supports a scope of the claims to other embodiments that are not shown or described, but which can be made and used by those skilled in the art. *See*, MPEP § 2164.08 at pp. 2100-186 to 188. The originally filed specification enables one skilled in the art to make and use the invention with the minimum values recited by the claims and appropriate upper values, which would be within the scope of the claims so long as the invention with the appropriate upper values functions for its intended purpose as an extended coverage sidewall sprinkler. Accordingly, Applicants respectfully request withdrawal of this objection and the rejection to the claims.

Claim 31 stands rejected under 35 U.S.C. 112, second paragraph, as being indefinite in the use of the alternative language "or." Applicants respectfully note that claim 31 has been amended to delete the phrase "or oblique to" in claim 31, thereby rendering this rejection moot.

New claim 62 has been added to particularly point out and distinctly claim Applicants' invention. Claim 62 depends from claim 1 and recites that the canopy portion has a surface distal from a central axis, and the distal surface is parallel to the central axis. Support for the

amendment to claims is provided by the originally filed specification at, for example, pages 4-13 and illustrated in originally filed Figs 1-13.

Claims 2-11, 14, 15, 21-23, 26-41, 43, 44, 49, 51-54, and 62 depend ultimately from one of claims 1, 20, 24, 25, 42, 45-48, and 50, are also allowable at least because claims 1, 20, 24, 25, 42, 45-48, and 50 are allowable, as well for reciting additional features.

In view of the foregoing amendments and remarks, Applicants respectfully request the reconsideration and reexamination of this application and allowance of the pending claims 1-11, 14-15, and 20-62. Applicants respectfully invite the Examiner to contact the undersigned at (609) 919-6644 if there are any outstanding issues that can be resolved via a telephone conference.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

**EXCEPT** for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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**IN THE CLAIMS:**

Claims 12 and 13 have been canceled without prejudice or disclaimer.

Claim 62 has been added.

Claims 1, 5-11, 14, 15, 20-25, 31-38, 42, 46, 47, and 50 have been amended as follows:

1. (Twice Amended) An extended coverage to a sidewall automatic fire sprinkler comprising a generally tubular body with a central passageway and a central axis, one end of the passageway forming an outlet at one end of the tubular body, a closure at the one end of the tubular body at least essentially generally closing the passageway, a trigger positioned to releasably retain the closure at the outlet closing the passageway, and a deflector at a discharge end of the sprinkler, the deflector being coupled with the tubular body facing and spaced axially away from the outlet and intersecting the central axis, the tubular body having a K factor greater than 9, the deflector having a face portion generally orthogonal to the central axis and a canopy portion being coupled to the face portion at a first canopy end and extending generally along the central axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance, and the deflector being shaped and positioned to transform water discharged horizontally from the outlet upon release of the closure by the trigger into a spray pattern of water droplets dispersed over a generally horizontal, generally rectangularly-shaped extended coverage area of more than one hundred square feet located on one side of the sprinkler in an amount and with a distribution effective to control an ordinary hazard fire in the coverage area.

5. (Twice Amended) The sprinkler of claim 1, wherein the ~~at least~~ generally rectangular shaped coverage area receiving water from said sidewall sprinkler is up to about two hundred and fifty six square feet in size.

6. (Twice Amended) The sprinkler of claim 5, wherein the ~~at least~~ generally rectangularly shaped

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coverage area receiving water from said sidewall sprinkler is up to about three hundred and twenty square feet in size.

7. (Twice Amended) The sprinkler of claim 1, wherein the ~~at least~~ generally rectangularly shaped coverage area is more than three hundred and twenty and up to about three hundred eighty four square feet in size.

8. (Twice Amended) The sprinkler of claim 7, wherein the ~~at least~~ generally rectangularly shaped coverage area is ~~up to~~ about three hundred and eighty-four square feet in size.

9. (Amended) The sprinkler of claim 1, wherein the coverage area is at least sixteen feet by sixteen feet-square and up to about sixteen feet by twenty four feet.

10. (Amended) The sprinkler of claim 9, wherein the coverage area is ~~up to at least~~ about sixteen feet by eighteen feet in size.

11. (Amended) The sprinkler of claim 10, wherein the coverage area is ~~up to~~ about sixteen feet by twenty feet in size.

14. (Twice Amended) The sprinkler of claim 1, wherein the ~~deflector comprises an at least generally planar~~ face portion is positioned facing and spaced axially away from the outlet along the central axis so as to ~~at least~~ perpendicularly intersect the column of water issuing from the outlet along the central axis and ~~a the~~ canopy portion being supported on one side of the face portion spanning the face portion, the canopy portion being generally parallel with the central axis and perpendicular to the face portion, the ~~deflector~~ face portion and canopy portion being configured to deliver water to the coverage area in a density of at least 0.15 and up to about 0.20 gallons per minute/ft<sup>2</sup> to achieve a generally planar spray pattern of water droplets generally

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parallel to a major side of the canopy portion facing the central axis, the spray pattern extending up to about twenty feet beyond the face portion and up to about eight feet to either lateral side of the central axis when the sprinkler is positioned with the central axis horizontal and the major side of the canopy portion facing the central longitudinal axis being generally horizontal and above the central longitudinal axis whereby said ceiling sprinkler is effective in controlling ordinary hazard fires over an extended coverage area of more than one hundred square feet and up to about three hundred eighty four square feet when pressurized to supply water at a rate of between about 0.15 and about 0.20 gallons per minute/ft<sup>2</sup> times the size of the coverage area in square feet.

15. (Amended) The sprinkler of claim 14, wherein the coverage area is at least three hundred and twenty square feet and up to about three hundred eighty four square feet.

20. (Amended) A sidewall automatic fire sprinkler comprising a generally tubular body with a central passageway and a central axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than 9 gpm/(psi)<sup>1/2</sup>, a closure at one end of the tubular body closing the passageway, a thermally responsive trigger positioned to releasably retain the closure at the outlet closing the passageway before activation of the trigger by heat, and a deflector at a discharge end of the sprinkler, the deflector being coupled with the tubular body facing and spaced axially away from the outlet so as to intersect the central axis, the deflector having a face portion oriented ~~at least~~ generally perpendicularly with respect to the central axis and located on one lateral side of the central axis and a canopy portion oriented generally parallel to the central axis and being located on another lateral side of the central axis opposite the one lateral side, the canopy portion being coupled to the face portion at a first canopy end and extending generally along the axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from

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the outlet at a second distance greater than the first distance, the deflector further being configured, with the sprinkler in a normal operating orientation with the central axis generally horizontal and the canopy portion generally centered over the face portion, to deflect water discharged through the outlet after activation of the sprinkler ~~at least~~ substantially uniformly over a coverage area generally rectangular in shape, the coverage area being more than one-hundred square feet in size and being located generally symmetrically with respect to the central axis, the coverage area extending from the deflector in a direction away from the orifice.

21. (Amended) The sidewall automatic fire sprinkler of claim 20 wherein the deflector is further configured, with the sprinkler in the normal orientation with the canopy portion generally horizontal and above the face portion of the deflector, to deliver after release of the closure, water supplied through the tubular body at a rate of at least 0.15 and up to about 0.20 gallons per minute per square foot for each square foot of the coverage area, sufficiently uniformly over the coverage area to control an ordinary hazard fire located anywhere within the coverage area with only the supplied water, with the coverage area being more than ~~ten feet wide and ten feet long~~ one hundred square feet and up to about three hundred eighty four square feet and located at a height of only three feet below the canopy portion of the deflector.

22. (Amended) The sidewall automatic fire sprinkler of claim 21 wherein the coverage area is up to sixteen feet wide and at least sixteen and up to about twenty four feet long.

23. (Amended) The sidewall automatic fire sprinkler of claim 22 wherein the coverage area is at ~~least~~ about -sixteen feet wide and more than sixteen and up to about twenty four feet long.

24. (Twice Amended) An extended coverage sidewall automatic fire sprinkler comprising:  
a generally tubular body with a central passageway being disposed along a central axis and forming an outlet at an end of the generally tubular body, the central passageway having a K

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factor greater than 9 and up to about 14;

a closure located at the end of the generally tubular body:

a trigger positioned to releasably retain the closure to occlude the outlet;

two frame arms coupled to the generally tubular body proximate the outlet, the two frame arms being located on a plane which intersects the central axis;

a deflector being coupled with the tubular body by the two frame arms along the central axis and spaced axially away from the outlet to transform water discharged horizontally from the outlet upon release of the closure by the trigger into a spray pattern of water droplets dispersed over a generally horizontal, generally rectangularly-shaped extended coverage area of at least two hundred ~~and fifty-six~~ and up to about three-hundred eighty four square feet on one side of the sprinkler in an amount and with a distribution effective to control an ordinary hazard fire in the coverage area; and

wherein the deflector includes a face portion oriented ~~at least~~ generally perpendicular with respect to the central axis, the face portion consisting of a single flow opening, a canopy portion oriented generally parallel to the central axis, the canopy portion having a generally flat planar surface substantially parallel to the plane on which the frame arms are located, and two support arms coupling the canopy and the face, to define ~~at the~~ a single flow opening through the face portion of the deflector.

25. (Amended) An extended coverage sidewall automatic fire sprinkler comprising:

a generally tubular body with a passageway being disposed along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a closure proximate the end of the generally tubular body:

a trigger that retains the closure to occlude the outlet until actuation of the trigger; and

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a deflector being coupled with the tubular body and spaced axially away from the outlet, the deflector including a face portion oriented generally perpendicular with respect to the axis and a canopy portion oriented generally parallel to the axis, the canopy portion having a surface distal to the outlet consisting of a generally flat surface ~~generally flat surface perpendicular to disposed on a plane passing through the axis.~~

29. (Amended) The sprinkler of claim 25, further including only two support arms coupling the flat canopy and the face portion of the deflector, the two support arms being spaced apart by at least about 1.5 inches.

31. (Amended) The sprinkler of claim 30, wherein the canopy portion comprises a distal surface generally parallel to the longitudinal axis above an area to be protected, the distal surface consisting of a generally flat surface disposed on the plane, the plane being is-oriented in at least one orientation, which is one orientation generally parallel to or oblique to the axis.

32. (Amended) The sprinkler of claim 30, wherein the amount of water being discharged is at a density of at least 0.15 and up to about 0.20 gallons per minute per square feet.

33. (Amended) The sprinkler of claim 32, wherein the amount of water being discharged is at a density of about 0.20 gallons per minute per square feet ~~or greater.~~

34. (Amended) The sprinkler of claim 33, wherein the extended-coverage area is greater than 100 square feet and up to about 384 square feet.

35. (Amended) The sprinkler of claim 33, wherein the water flow from the outlet is at least 38 gallons per minute and up to about 48 gallons per minute.

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36. (Amended) The sprinkler of claim 33, wherein the extended-coverage area including a length and a width, each of the length and the width being greater than 10 feet and up to about 24 feet.

37. (Amended) The sprinkler of claim 36, wherein the extended coverage including a length and a width, ~~each~~one of the length and the width being at least 16 feet and up to about 24 feet such that the extended-coverage area is at least 256 square feet and up to about 384 square feet.

38. (Amended) The sprinkler of claim 37, wherein the extended-coverage area is at least 320 and up to about 384 square feet.

40. (Amended) The sprinkler of claim 39, wherein the K factor is about 14 ~~or greater~~.

42. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

a generally tubular body with a passageway disposed along an axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than 9, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a closure positioned proximate the outlet so as to occlude the passageway;

a trigger that retains the closure at the outlet until actuation of the trigger; and

a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet, upon release of the closure by actuation of the trigger, at a density of at least 0.15 gallons per minute per square feet, the deflector having a face portion generally orthogonal to the axis and a canopy portion being coupled to the face portion at a first canopy end and extending generally along the axis away from the outlet towards a second canopy-free end, the first canopy end being spaced at a first

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distance from the outlet, the ~~second canopy~~free end being spaced from the outlet at a second distance greater than the first distance.

43. (Amended) The sprinkler of claim 42, wherein the deflector transforms water being discharged from the outlet so as to provide a density of about 0.20 gallons per minute per square ~~feet or greater~~.

44. (Amended) The sprinkler of claim 43, wherein the deflector transforms water being discharged from the outlet at a rate of at least 38 gallons per minute and up to about 48 gallons per minute.

45. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:  
a generally tubular body defining a passageway along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

~~at least one~~ a frame arm being coupled to the end of the generally tubular body, the ~~at least one~~ frame arm being located generally on a horizontal plane, which is generally parallel to an area to be protected;

a closure proximate the end of the generally tubular body;

a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and

a deflector assembly having a face portion generally orthogonal to the axis and a canopy portion being coupled to a face portion at a first canopy end and extending generally along the axis away from the outlet towards a free end, the first canopy end being spaced at a first distance



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from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance, the deflector assembly being coupled to the generally tubular body by the at least one frame arm so as to be spaced from the outlet along the axis so that when the heat responsive trigger is actuated, the closure is positioned to allow a flow of fluid to issue horizontally from the outlet of the generally tubular body over an extended-coverage area.

46. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

a generally tubular body defining a passageway along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

~~at least one~~ a frame arm being coupled to the end of the generally tubular body, the ~~at least one~~ frame arm being located generally on a vertical plane, which is generally perpendicular to an area to be protected;

a closure proximate the end of the generally tubular body;

a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and

a deflector assembly being coupled to the generally tubular body by the ~~at least one~~ frame arm so as to be spaced from the outlet along the axis so that when the heat responsive trigger is actuated, the closure is positioned to allow a flow of fluid to issue horizontally from the outlet of the generally tubular body over an extended-coverage area, the deflector having a face portion extending generally orthogonal to the axis and a canopy portion having a surface distal to the outlet and generally parallel to the longitudinal axis above an area to be protected, the distal surface consisting of a generally flat surface generally perpendicular to a plane passing through the longitudinal axis, the canopy portion being coupled to the face portion by only two support arms.

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47. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:
- a generally tubular body defining a passageway along an axis, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;
  - a closure proximate the end of the generally tubular body;
  - a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and
  - a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet, upon release of the closure by actuation of the trigger, over a generally horizontal extended coverage area so as to control a fire in the coverage area, the deflector having a face portion extending generally orthogonal to the axis, the face portion consisting of a single flow opening and a canopy portion being coupled to the face portion by only two support arms defining ~~a~~ the single flow opening therebetween.

48. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:
- a generally tubular body defining a passageway along an axis, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;
  - a closure positioned proximate the outlet so as to occlude the passageway;
  - a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and
  - a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet upon release of the closure by actuation of the trigger over a generally horizontal extended coverage area so as to control a fire

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in the coverage area, the deflector having a face portion extending generally orthogonal to the axis and a canopy portion, the face portion consisting of a single flow opening, the canopy portion being coupled to the face portion by only two support arms symmetrical to the axis, the two support arms defining a the single flow opening having a distance of at least about 1.5 inches between proximal surfaces of each support arm.

49. (Amended) The sprinkler according to any one of claims 45-48, wherein the deflector transforms water at a rate of at least 38 and up to about 48 gallons per minute discharged horizontally from the outlet at a density of at least 0.15 and up to about 0.20 gallons per minute per square feet over the extended-coverage area.

50. (Amended) A fire protection system for a structure, the structure having an area to be protected, the area being disposed generally on a first plane and at least one wall disposed generally on a second plane, which is generally perpendicular to the area, the system comprising:

at least one pipe in communication with a fluid supply; and

at least one sprinkler being coupled to the at least one pipe and projecting from the at least one wall toward a boundary of the area to be protected, the at least one sprinkler including:

a generally tubular body with a passageway disposed along an axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge; and

a deflector being coupled to the tubular body and spaced from the outlet, the deflector deflects water being discharged through the outlet after activation of the sprinkler substantially uniformly over an extended-coverage area, the deflector having a face portion oriented generally perpendicularly with respect to the axis and a canopy portion oriented generally parallel to the axis, the canopy portion having a fluid deflecting surface portion furthest from the axis above the



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outlet, the fluid deflecting surface portion consisting of a generally flat planar surface rectangular  
in cross-section.

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